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Ergonomic Evaluation of Musculoskeletal Disorders with Rapid Office Strain Assessment and Its Association with Occupational Burnout among Computer Users at Zabol University of Medical Sciences in 2017

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Abstract: In spite of increased production and productivity, there are different adverse effects of technology expansion such as psychological stresses, increased incidence of musculoskeletal disorders, inactivity and fatigue. Several approaches and strategies have been introduced to deal with occupational burnout and reduce musculoskeletal disorders, including setting up training programmes, ergonomic principles for working, job rotation, relaxing and sharing information on occupational burnout and musculoskeletal disorders among employees. The purpose of this study was to investigate the relationship between musculoskeletal disorders and occupational burnout in the computer users in Zabol University of Medical Sciences, Iran. The present descriptive-analytic study was performed on all computer users in Zabol University of Medical Sciences. Participants (n = 70) were selected by census method. Data collection tools were physical posture assessment checklist using Rapid Office Strain Assessment (ROSA) and Geldard Burnout Inventory (GBI). The opinions of the respective experts were used to confirm the validity of the questionnaires. Then, the questionnaires were distributed among computer users.

Finally, collected data were analyzed by SPSS 19 software and P <0.05 was considered as significance level. Pearson correlation coefficient showed a direct and significant statistical relationship between the occupational burnout and the musculoskeletal disorders and indicated that the occupational burnout level was elevated among employees by increasing the musculoskeletal disorders. Given the obvious relationship between the occupational burnout and the musculoskeletal disorders, the managers of organizations are required to plan programmes to improve work conditions, reduce stress, modify working instrument and train ergonomic principles for working.

Key words: Rapid office strain assessment, job burnout, musculoskeletal disorders, computer users.

Introduction

Working in an unpleasant and distressed condition, can cause various discomforts in the body organs (GHaljahi et al., 2017). If people work for a long time in such situations, they may suffer from discomforts in the musculoskeletal system and ultimately experience the occupational burnout. Therefore, the presence of inappropriate working environment conditions and their non-compliance with standards are the most important factors in exploring many health concerns and occupational diseases (Widiger, 2005).

The musculoskeletal disorders are one of the major

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causes of occupational injury and disability in developed and developing countries (Maul, 2003), accounting for 60% of all new cases of diseases based on research conducted in the United States, as their incidence rose to a high growth rate from 5% in 1981 to 30% in 1991(Vanwonterghem, 1996). The musculoskeletal disorders are associated with impairments of the muscles, tendons, tendon sheath, peripheral nerves, joints, bones, ligaments and blood vessels, which occur as a result of improper postural movements and excessive force over time, or an instantaneous or acute trauma (Hossain, 2014).

Administrative jobs due to the nature of the work and the types of activities are among the occupations where the prevalence of musculoskeletal disorders is highly reported, and are related primarily to disorders in the upper extremities of the head, neck and back (Wahlstrom, 2005), as well as are associated with symptoms such as pain (GHaljahi, 2018), anesthesia, tingling, losing work time, reducing productivity, and increasing occupational indemnity costs (Village et al., 2005).

The National Occupational Safety and Health Institute (NIOSH) in the US classified occupational diseases and complications in which the musculoskeletal disorders are ranked second behind respiratory diseases (Habibi et al., 2008). One of the equipment found at all workplaces is a computer with a significant increase in usage over the past 20 years. The most important risk factors among this group of employees, in addition to individual factors, are those associated with the design of the workstation, such as the duration of using the computer, the number of people resting (Palangi et al., 2018), the method of working with the keyboard, the status of the computer monitor, and the type and usage of devices connected to the computer (Johnston et al., 2008). The occupational exposure to these risk factors in the occupational environments can cause various diseases and conditions, such as tenosynovitis, back pain and carpal tunnel syndrome (Radwin, 2006).

Another problem in the workplace is the high rate of occupational burnout, which happens when working in jobs that people spend a lot of working hours in close contact with other people (Brooking, 1992). The occupational burnout is defined as reducing the ability of individuals to adapt to stressors (Widiger et al., 2002). According to Maslach's definition, the occupational burnout is said to be emotional exhaustion, depersonalization and reduced personal accomplishment in those involved in service delivery (Maslach et al., 1981).

Some of the factors affecting the occupational burnout include excessive workload, job type, inappropriate work conditions and role conflict. In addition, the occupational burnout effects can be manifested as physical signs (such as headaches and digestive disorders) (Hakanen et al., 2007) and behavioral symptoms (such as failure at work, absenteeism (Soltanian et al., 2009), early retirement, inappropriate performance and increased sick leave) (Ericson et al., 2007).

According to the introduction, it can be said that continuous work with computers and performing tasks in static sitting conditions can be of the risk factors for musculoskeletal disorders. The prevalence of these complications imposes many financial and human losses. Therefore, preventing their incidence is a necessary action. In addition, according to the importance of psychological factors such as occupational burnout and musculoskeletal disorders in terms of worker health and productivity, and given the role of working conditions in inducing these problems, and since most of the research carried out in Iran is on the prevalence and causes of occupational burnout, and because no study has evaluated the association between musculoskeletal disorders and occupational burnout in computer users, this study was designed for ergonomic evaluation of musculoskeletal disorders among computer users and then determination of the relationship between occupational burnout and these disorders.

Materials and Methods

The present descriptive-analytical and cross-sectional study was conducted in 2017 among personnel of all administrative departments at Zabol University of Medical Sciences. The statistical population of this study was all administrative staff who entered the study by census method due to the limited statistical population. Inclusion criteria were at least one year of work experience and work with the computer at least three hours a day. Exclusion criteria included people with pain or discomfort in various organs of the body due to an accident, and unwillingness to complete the questionnaire and collaborate. Eventually, 70 people participated in the research.

The data collection tool included the ROSA checklist (Sonne et al., 2012), which has been developed based on the standard guidelines (EN-ISO9241, 1997) (Heimgartner, 2014). It is a pen-and-paper and observational method that can determine the ergonomic risk factors and has a good reliability in evaluating the musculoskeletal disorders. The assessment consists of

three parts, and the points in the chairs, the individual posture during sitting, the screen, the phone, the mouse and keyboard score, and the person's posture while using these tools, and the duration of using each of these tools per day are recorded in the corresponding tables for each section, and finally the final ROSA score is determined.

In this way, first, the work station and individual posture are scored in different sections according to the ROSA checklist; at last, a final score is obtained between 0 and 10, indicating scores of 0 to 3 as low risk level, scores of 3 to 5 as safety warning level, and scores over 5 as the need for ergonomic intervention (Tabatabaei et al., 2015).

The GBI was used to evaluate the occupational burnout (Esfandiari, 2001). It consists of 40 items on how people feel about their job and to what extent they are at risk of the occupational burnout. Each question earns a score of 1 to 7; the questions 38, 37, 35, 34, 31, 27, 25, 22, 21, 18, 13, 9, 8, 7, 4, 3, 1 and 40 were scored as (completely agree, 1), (agree, 2), (fairly agree, 3), (no idea, 4), (fairly disagree, 5), (disagree, 6), (completely disagree, 7); and other questions were scored as follows (completely agree, 7), (agree, 6), (fairly agree, 5), (no idea, 4), (fairly disagree, 3), (disagree, 2), (completely disagree, 1).

After completing the questionnaire, we wrote a score on the right side of the page near each question. To get the total GBI score, the scores of all questions were added and the following key was used to interpret the results.

Score	*Interpretation*
40-80	You are a very active person.
81-120	You do your job well.
121-200	Why do you not think further about yourself? You deserve to be loved. Love yourself.
201-280	An urgent action is needed. Your GBI score is very high.

According to the Geldard Burnout Inventory, the subjects were divided into four categories:

1. People who are very active (GBI score below 81)
2. People who do their job well (GBI score between 81 to 120)
3. People who are not in good condition (GBI score from 121 to 200)
4. People who are in need of urgent action (GBI score over 200).

A pilot study was conducted to assess the reliability of the questionnaire, and Cronbach's alpha was obtained to be 78% that indicated a high validity of the questionnaire. The collected data were encoded into a computer for analysis using the SPSS19 software. The relationship between variables was determined by descriptive statistics (mean, standard deviation, frequency and percentage) and inferential statistics (independent t-test, one-way ANOVA, Pearson correlation coefficient and Tukey's post hoc test).

Ethical considerations in this research were also observed. The study participants were assured that all the information received from this project would be evaluated by the relevant researchers and would remain confidential.

Result and Discussion

Altogether, 70 people performed postural assessment and completed GBI, the mean and standard deviation for ROSA and GBI were, respectively, 5/58±1/37 and 124/96±23/19 (Table 1).

Table 1: The mean and standard deviation Rapid Office Strain Assessment (ROSA) and Geldard Burnout Inventory (GBI) in study subjects

Variable	*Number*	*Mean*	*SD*	*Max*	*Min*
ROSA	70	5/58	1/37	9	**2**
GBI	70	124/96	23/19	58	**179**

According to the guidelines, the percentage of people in each section was 1.4% (1 person) at low risk level, 50% (35 persons) at safety warning level and 48.6% (34 persons) at the need for ergonomic intervention (Table 2).

Table 2: Frequency distribution of people at different levels of ROSA

ROSA		*Number*	*Percent*
Score less than 3	Low risk	1	**1.4**
Score 3-5	Safety warning	35	**50**
Score over 5	Need for Ergonomic intervention	34	**48.6**

Moreover, our participants composed of 40 women (57.1%) and 30 men (42.9%). The work places at Zabol University of Medical Sciences include the Deputy of Education (n = 10), Deputy of Treatment (n = 9), Imam Khomeini Hospital (n = 4), School of Pharmacy (n = 4), School of Medicine (n = 4), Deputy of Students and Cultural Affairs (n = 4), School of Public Health (n =

9), Deputy of Development and Management (n = 14), and Deputy of Health (12) (Table 3).

Table 3: Frequency distribution and frequency of subjects according to gender and places studied

	Variable	*Number*	*Percent*
Gender	Female	40	57.1
	Male	30	42.9
Place	Deputy of Education	10	14.3
	Deputy of Treatment	9	12.9
	Imam Khomeini Hospital	4	5.7
	School of Pharmacy	4	5.7
	School of Medicine	4	5.7
	Deputy of Students and Cultural Affairs	9	12.9
	School of Public Health	14	20
	Deputy of Development and Management	4	5.7
	Deputy of Health	12	12

The association of ROSA with gender and workplace is shown in Table 4. The independent t-test showed no statistically significant relationship between ROSA and gender (p-value > 0.05), but one-way ANOVA reported a significant relationship between ROSA and studied workplaces and Tukey's post hoc test revealed that ROSA in employees of Imam Khomeini Hospital was higher than in other groups.

According to Table 5 and independent t-test, a statistically significant relationship was found between occupational burnout and gender, so that the mean occupational burnout was higher in women than in men (p-value < 0.05). According to one-way ANOVA, there was no significant relationship between occupational burnout and the studied workplaces (p-value > 0.05).

In addition, Pearson correlation coefficient at 5% error level confirmed a direct and significant statistical relationship between occupational burnout and ROSA, in which the depression rate among employees was elevated with increasing musculoskeletal disorders (p-value < 0.05, r = 0.136) (Table 6).

Table 4: The relationship between ROSA with gender and place in the students

	Variable	*Number*	*Mean*	*SD*	*P-value*
Gender	Female	40	5.62	1.35	0.784
	Male	30	5.53	1.41	
Place	Deputy of Education	10	5.4	1.5	0.045
	Deputy of Treatment	9	6.47	1.73	
	Imam Khomeini Hospital	4	6.95	2.06	
	School of Pharmacy	4	5.5	0.57	
	School of Medicine	4	5.25	0.95	
	Deputy of Students and Cultural Affairs	9	5	1.5	
	School of Public Health	14	5.21	0.7	
	Deputy of Development and Management	4	5.25	0.96	
	Deputy of Health	12	5.67	1.3	

Table 5: The relationship between occupational burnout with gender and place in the students

	Variable	*Number*	*Mean*	*SD*	*P-value*
Gender	Female	40	124.4	23.37	0.012
	Male	30	121.7	22.9	
Place	Deputy of Education	10	130.8	18.71	0.942
	Deputy of Treatment	9	122.33	22.55	
	Imam Khomeini Hospital	4	138.25	20.95	
	School of Pharmacy	4	126	17.68	
	School of Medicine	4	116.5	10	
	Deputy of Students and Cultural Affairs	9	126.22	31.78	
	School of Public Health	14	123.5	21.24	
	Deputy of Development and Management	4	134.25	37.18	
	Deputy of Health	12	121.08	26.55	

Table 6: The relationship between occupational burnout with ROSA

	Occupational burnout		
	Number	*Pearson correlation coefficient*	*P-value*
ROSA	70	0/136	0/034

The present study found no significant relationship between gender and postural assessment, but there was a significant statistical relationship between postural assessment and studied workplaces. It was observed that the staff of Imam Khomeini Hospital needed to modify immediately their physical posture; this may be due to the hospital's working conditions. It was also indicated that there was a significant relationship between the occupational burnout and gender, so that the mean occupational burnout was higher in women than in men, but there was no significant relationship between the occupational burnout and the studied workplaces.

Many studies have been carried out so far regarding the posture assessment methods and the occupational burnout, but very little study between the occupational burnout and body posture. The findings of this study found a significant relationship between the occupational burnout and the musculoskeletal disorders. Those who were at the level of need for ergonomic intervention showed higher occupational burnout, in line with the results of Tabatabai et al. (2015) and Bolghanabadi et al. (2014). However, they studied occupational fatigue and subscales of occupational burnout. In the same vein, Mokammelkhah et al. investigated the general health and the musculoskeletal disorders and concluded that the staff with musculoskeletal disorders had less general health compared to the control group (Rempel et al., 1999).

At last, it is suggested to train computer users on the ergonomic information of work places, suitable arrangement of work station and other ergonomic skills. This report was given to authorities to be included in training programmes for staff, and it was argued that the ergonomic knowledge is important in informing users about the potential risks of prolonged sitting and constant postures when working with a computer. Grim et al. and Rample et al. (Greene et al., 2005) also exhibited that the ergonomics-training programmes were able to modulate the risk of employee's perceptions. Robertson et al. (2009) also reported that the ergonomics training in the work environments has been able to significantly improve perceived control of body postures and arrangement pattern of work station.

Conclusions

1. As each research has typically some constraints, the present study also faced some limitations as they prevented the selection of larger sample size.
2. Considering that human forces are of the most important resources of each organization, the prevalence of musculoskeletal disorders and increased occupational burnout are important to reduce the productivity, job satisfaction and disability of the staff, so the necessary measures should be taken to prevent these problems.
3. In addition to eliminating physical problems and improving the ergonomics of the workplace, further attention must be paid to address the mental and psychological problems of working people.

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